Question 2: Executive Report for CEO by Michael Dowd

Introduction

In this report I will be presenting my findings from the analysis of game sales data, ultimately with the aim of answering the question: what choices should we make to maximise potential game sales?

Best Selling Games of All Time

The following are the top 5 selling games of all time

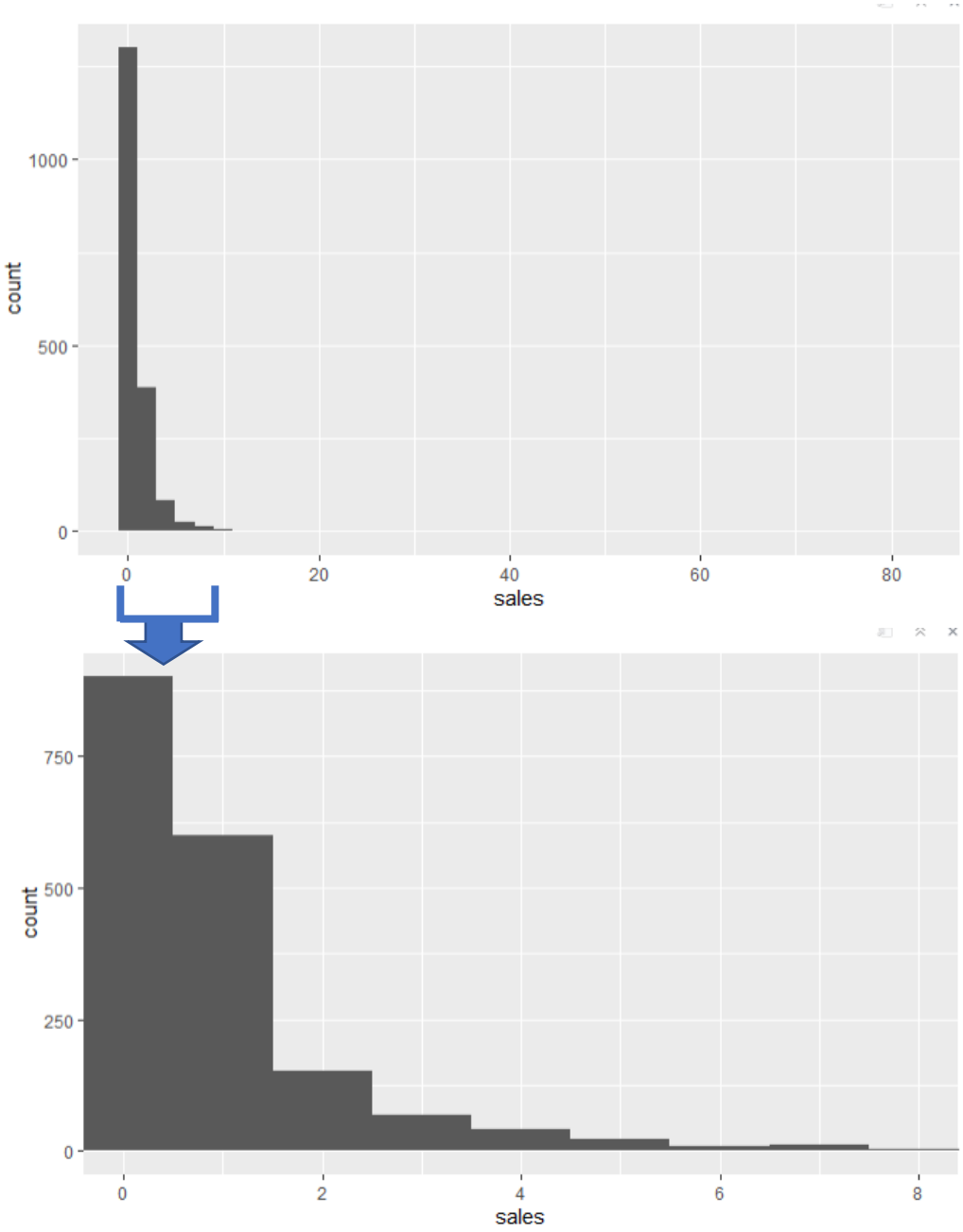
	Name	Genre	Platform	Publisher	Sales (million)
1	Wii Sports	Sports	Wii	Nintendo	82.53
2	Mario Kart Wii	Racing	Wii	Nintendo	35.52
3	Wii Sports Resort	Sports	Wii	Nintendo	32.77
4	New Super Mario Bros.	Platform	DS	Nintendo	29.80
5	Wii Play	Misc	Wii	Nintendo	28.92

Note the following:

- Top 5 bestselling games are *all published by Nintendo*
- 4 of the 5 bestselling games *were on the Nintendo Wii*
- Each of these games sold *tens of millions of copies* globally

Data Summary and Statistics

I'd like to briefly discuss the sales data as a whole. The below chart shows the number of games that achieve certain numbers of sales. The sales are heavily right-skewed, meaning we have a few extreme outliers that have achieved 10s of millions of sales, pulling the average sales up well above that achieved by most games.

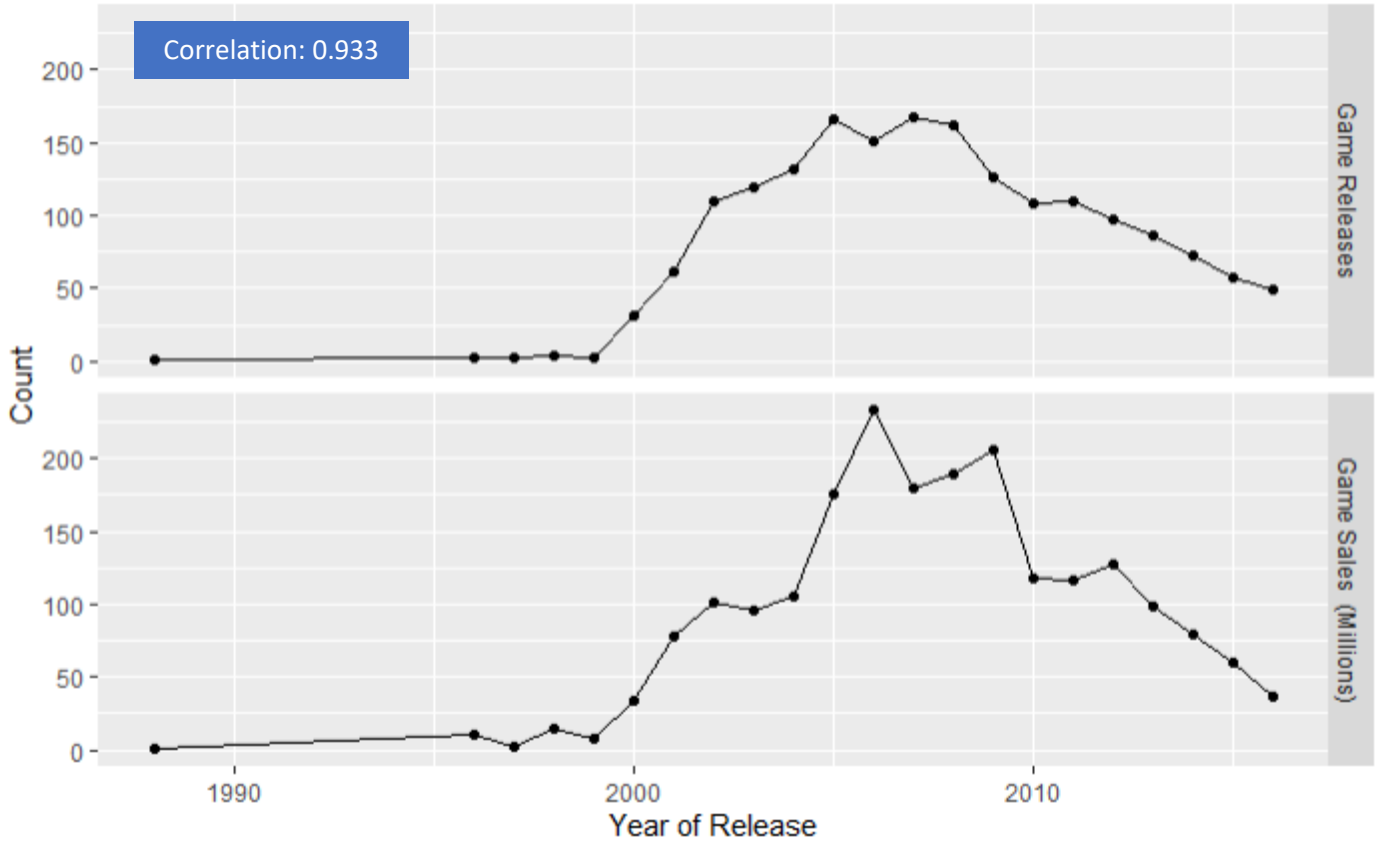


Some summary stats

- Max game sales: 82.52 million (Wii sports)
- Some other games have sold 10s of millions
- Average game sales is 1.13 million, but…
- **Most games sell less than 1 million** (median = 520,000)
- 95% of games sell less than 3.76 million

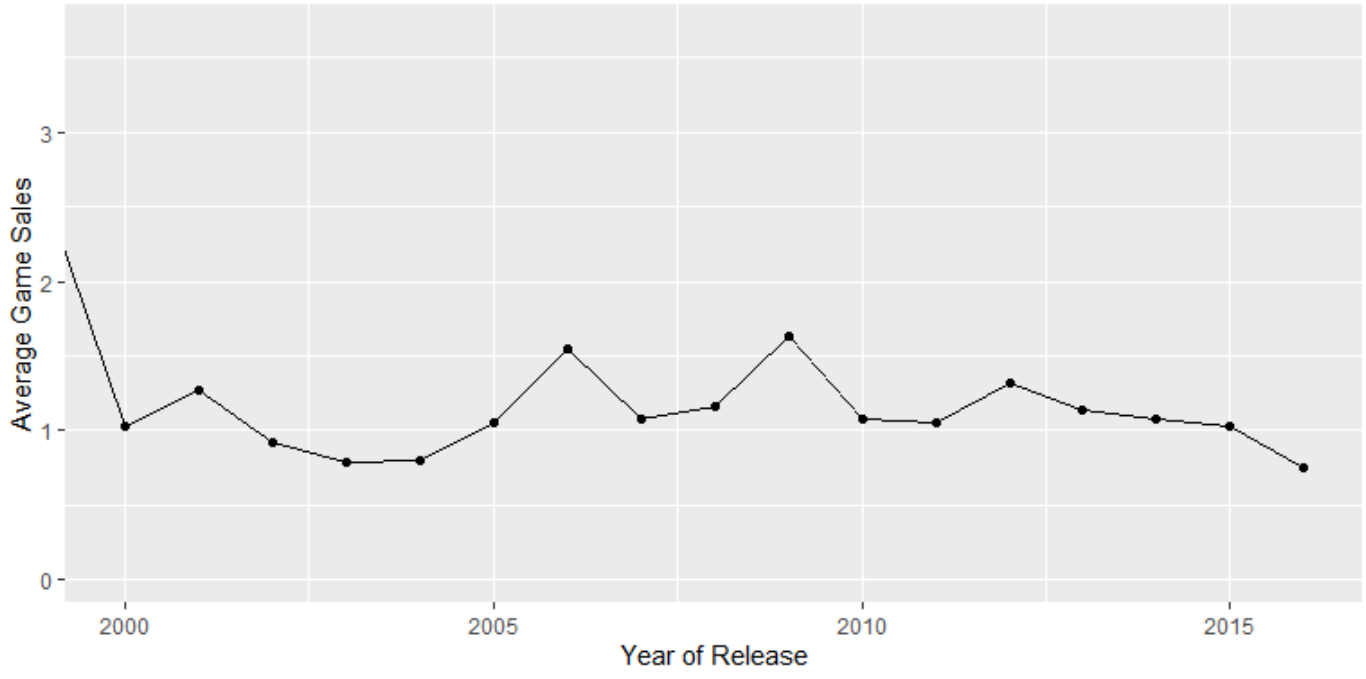
Games Sales Over Time

I've analysed total game sales over time, as they have been dropping in recent years. This might seem to indicate a decline in the games purchasing market, however I believe it might be related to the number of games released.

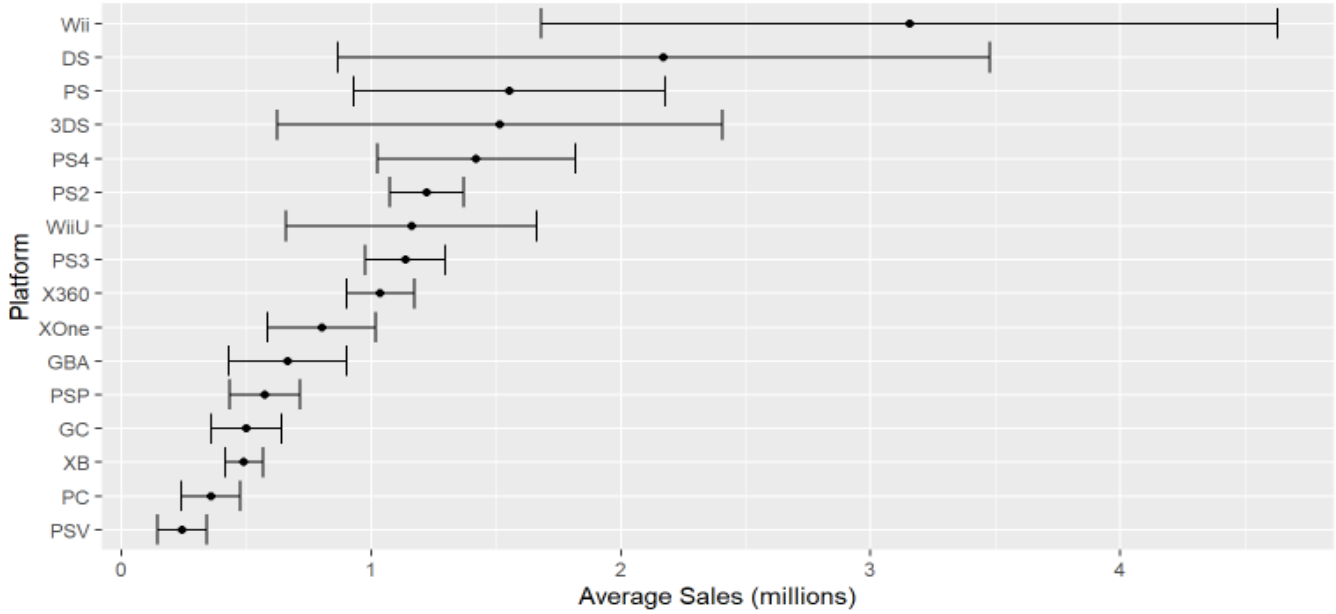


Game sales and number of game releases are *highly correlated*.

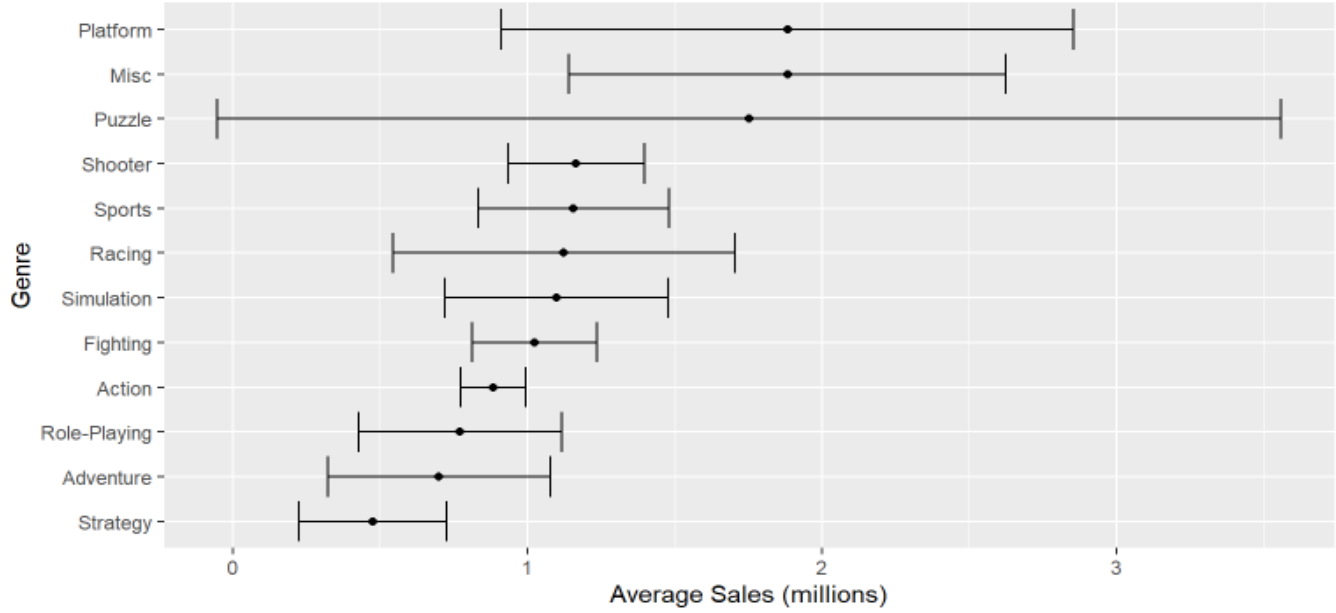
This correlation might suggest that sales is a function of game releases, but a causal link would be almost impossible to prove. However, I can say that there is no evidence to suggest an overall upwards or downwards trend in average game sales over the past 16 years, as indicated in the chart below:



Platforms and Genres

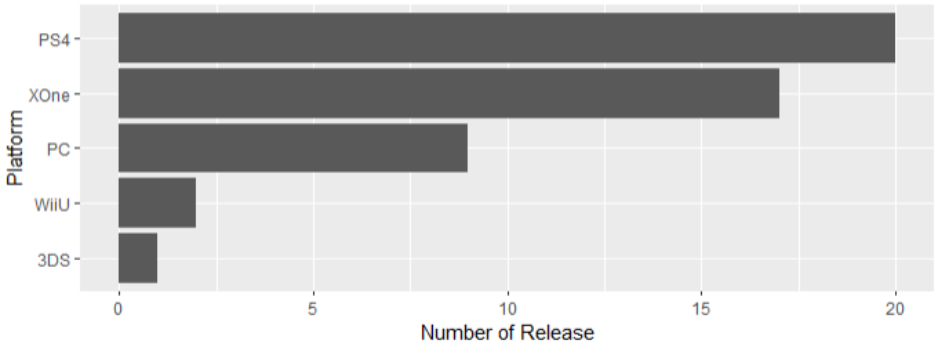


The Wii is the most popular platform of all time, though the wide error bars allow space for uncertainty here.



“Platform” is the most popular genre, but the large error bars imply there aren’t enough samples to back this up.

The gaming industry is relatively young and dynamic. Many publishers are now out of business and most game platforms that were once popular are now obsolete. These factors will constrain our choice of platform



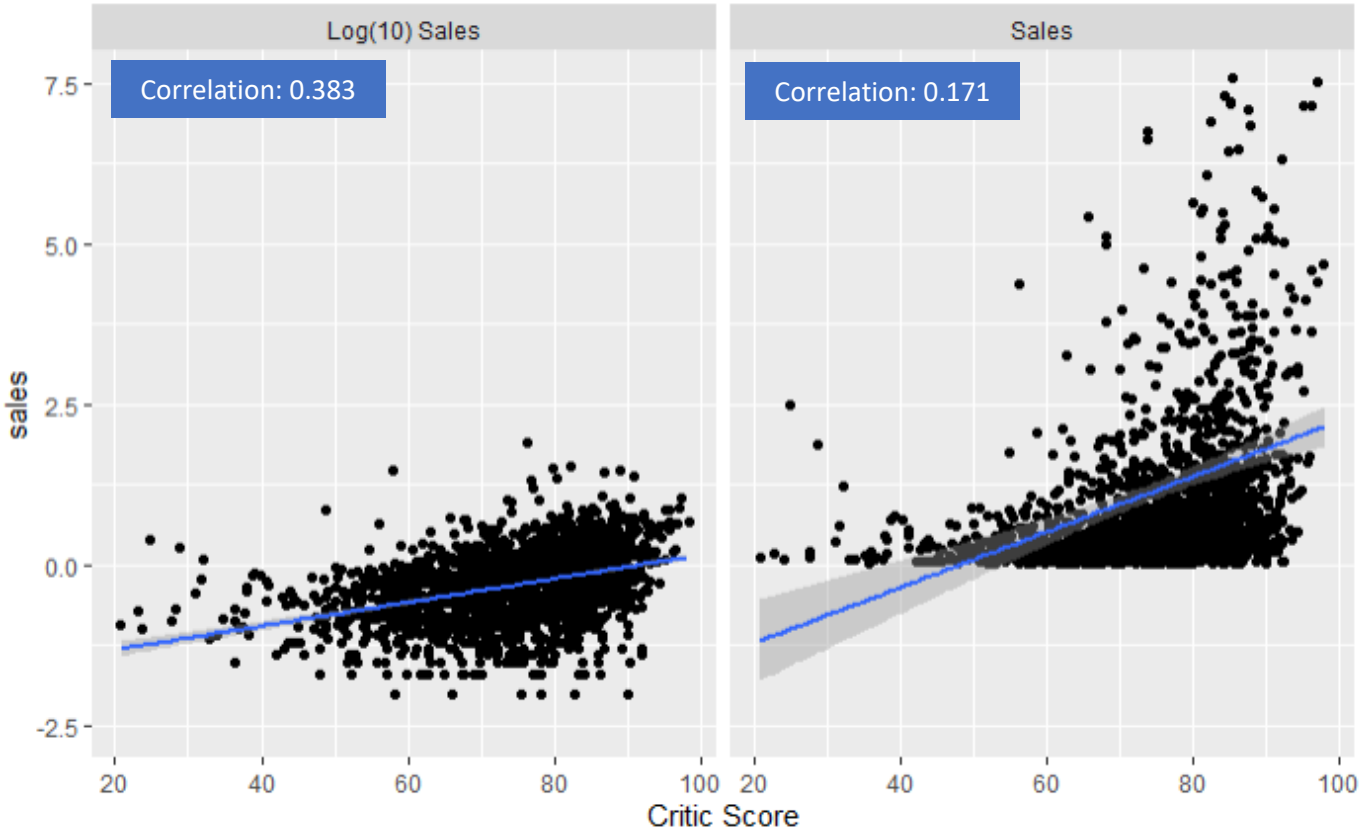
Games released in 2016 were limited to 5 platforms.

- PS4,
- Xone,
- PC,
- WiiU
- 3DS

- There are much fewer releases on the WiiU and 3DS

Critic Score and Sales

A linear model was fit and correlation tested on critic score against sales, and a relationship does exist.



LINEAR MODEL: SALES = 10 ^ (CRITIC SCORE X 0.018454 - 1.692167) X 1,000,000

Sales vs critic score is best modelled by Log-Adjusting sales figures – it's a non-linear relationship!

Interpreting the model

- Games with critic score of **0** will likely sell: **20,315** copies
- Games with critic score of **50** will likely sell: **170,033** copies
- Games with critic score of **100** will likely sell: **1,423,092** copies

The correlation and exponentially increasing sales suggest that it could be beneficial designing the game to appeal to critics with the aim of securing a high review score and increasing sales as a result.

Linear Categorical Model

There are 4 *categorical variables* we can control when designing a game:

- Genre
- Target Platform
- Game Rating
- Game publisher

The categorical data was analysed using a Multi-Variate Linear Model on Log-Adjusted Sales

- All 4 variables found to have a statistically significant impact on sales

Model Overview

The linear model assigns each possible option a coefficient, which tells us how that option will effect sales. These coefficients are presented in the chart below. Bigger coefficients suggest more sales as a result of choosing that option, while smaller coefficients suggest fewer sales.

NOTE: THE MODEL WAS FIT AGAINST LOG-ADJUSTED SALES, SO COEFFICIENTS AREN'T DIRECTLY RELATED TO SALES

Model Results: The First Choice

The Nintendo publisher coefficient is massive. This suggests building a game that we could get Nintendo to publish would maximise sales, however this introduces some constraints:

- They only publish games for their own platforms (Currently the 3DS and WiiU)
- They don't publish mature rated games

Though 3DS and E ratings don't have large coefficients themselves, the benefit of having Nintendo as publisher seems to outweigh the drawbacks of the constrained choices:

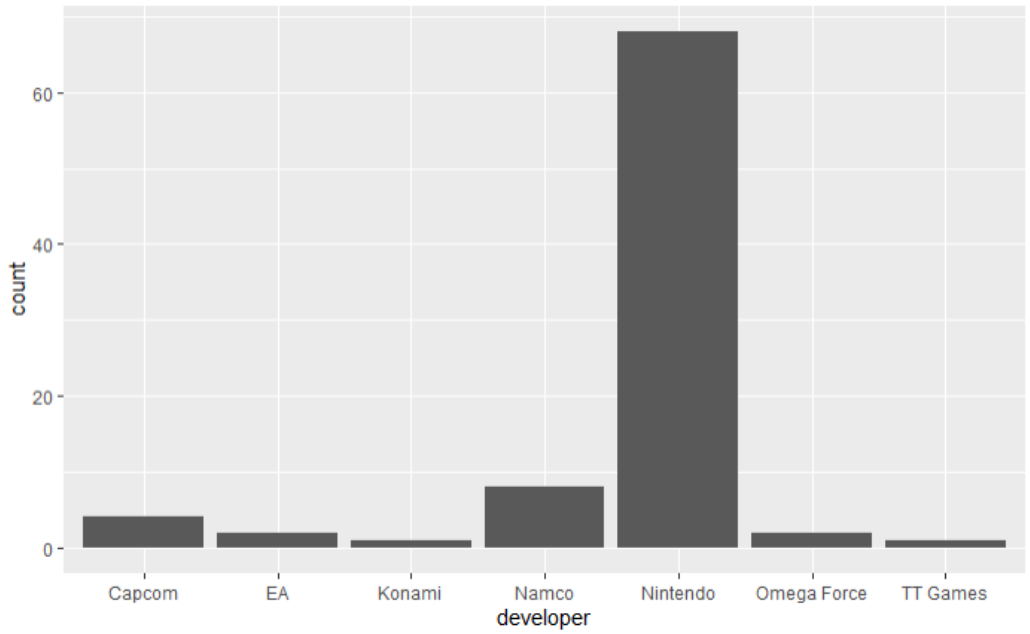
Intercept	Genre: Sim	Platform: 3DS	Publisher: Nintendo	Rating: E	Predicted Sales
-0.26742	+ 0.1648	0 (baseline)	+ 0.7429	+ 0 (baseline)	4.36 Million

COEFFICIENT TABLE FOR THE FIRST CHOICE

The linear model sales prediction for this combination of choices is: 4.36 Million

An Alternative Choice

The chart below shows that the majority of games published by Nintendo are developed in-house:



COUNT OF GAMES PRODUCED BY DIFFERENT DEVELOPERS PUBLISHED BY NINTENDO

This suggests a possibility that Nintendo might not agree to publish our game. In this event the following choice combination maximises sales:

Intercept	Genre = Fighting	Platform = PS4	Publisher = EA	Rating = M	Predicted Sales
-0.26742	0.135	0.3172	0.1252	+ 0.2885	2.23 Million

COEFFICIENT TABLE FOR THE ALTERNATIVE CHOICE

The linear model sales prediction for this combination of choices is: 2.23 Million

Some Interesting Findings

T-tests were used to investigate some of the interesting findings:

Games published by Nintendo really do sell better!

On average games published by Nintendo sell between 5 and 6.1 million copies more than other games

PS4 games sell better than XOne games!

On average games on the PS4 sell between 130K to 1.1 million more copies than games on the XOne

Puzzle games may not be that bad!

According to the statistical tests there isn't enough evidence to say that puzzle games have worse sales than all non-puzzle games. There just isn't enough data to confirm this.

Final Recommendations

Pursue the First Choice: *A family-friendly simulation game for the 3DS published by Nintendo:*

Genre = Simulation, Platform = 3DS, Publisher = Nintendo, Rating = E

If this is not possible, pursue the Alternative Choice: *A mature fighting game for the PS4 published by Electronic Arts*

Genre = Fighting, Platform = PS4, Publisher = Electronic Arts, Rating = M

Also, further data analysis would be beneficial. Analysis of the sales and review scores showed a strong correlation between sales and critic score:

- Identify common themes in critic game reviews associated with high or low scores
- Patterns identified here could form the basis for ongoing game design decisions